

June 4, 2003

ORGANIZATION: Nuclear Energy Institute

SUBJECT: SUMMARY OF MEETING WITH THE NUCLEAR ENERGY INSTITUTE
(NEI) TO DISCUSS TIME- LIMITED AGING ANALYSES (TLAA)
SUPPORTING INFORMATION FOR LICENSE RENEWAL
APPLICATIONS

On April 22, 2003, the U. S. Nuclear Regulatory Commission (NRC) staff met with the Nuclear Energy Institute (NEI) and other industry representatives to discuss time-limited aging analysis (TLAA) supporting information that should be included in license renewal applications (LRAs). The purpose was to maximize the efficiency of the LRA review process and minimize requests for additional information (RAIs). Enclosed are the meeting agenda (Enclosure 1) and the list of meeting attendees (Enclosure 2). The staff discussed their review experience of TLAA's based on Chapter 4 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR). The staff's general comments were that an applicant should review the staff's RAIs on previous LRAs and address them in its LRA, as appropriate, to minimize the RAIs on its application.

The staff also discussed reactor vessel neutron embrittlement analysis information to be included in the LRA (Enclosure 3). A summary of the staff's other discussion is provided in Enclosure 4.

In the meeting, it was agreed that this topic should be addressed through the interim staff guidance (ISG) process to document the lessons learned.

On May 12, 2002, the staff issued "Proposed Interim Staff Guidance (ISG)-16: Time-Limited Aging Analyses (TLAA's) Supporting Information for License Renewal Applications" for comment (see ADAMS Accession No. ML031320798).

/RA/

Peter J. Kang, Reactor Systems Engineer
License Renewal Section
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Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Project No.: 690

Enclosure: As stated

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On April 22, 2003, the U. S. Nuclear Regulatory Commission (NRC) staff met with the Nuclear Energy Institute (NEI) and other industry representatives to discuss time-limited aging analysis (TLAA) supporting information that should be included in license renewal applications (LRAs). The purpose was to maximize the efficiency of the LRA review process and minimize requests for additional information (RAIs). Enclosed are the meeting agenda (Enclosure 1) and the list of meeting attendees (Enclosure 2). The staff discussed their review experience of TLAA based on Chapter 4 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR). The staff's general comments were that an applicant should review the staff's RAIs on previous LRAs and address them in its LRA, as appropriate, to minimize the RAIs on its application.

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License Renewal Meeting
to
Discuss Supporting Information
for Time-Limited Aging Analyses (TLAA)
to be Included in License Renewal Applications

Room O-9B4
April 22, 2003
(1:00 PM-3:30 PM)

Meeting Agenda

- | | |
|--------------------------------------------------------------------------------|-------------|
| 1. Welcome/Introductions | 10 minutes |
| 2. Discussion of TLAA Supporting Information | 120 minutes |
| Reactor Vessel Neutron Embrittlement Analysis | |
| Metal Fatigue Analysis | |
| EQ of Electrical Equipment | |
| Concrete Containment Tendon Prestress Analysis | |
| Containment Liner Plate, Metal Containments, and Penetrations fatigue Analysis | |
| Other Plant-Specific TLAA | |
| 3. Public comments | 10 minutes |
| 4. Summary | 10 minutes |

Enclosure 1

NRC Meeting Attendance List

**TO DISCUSS SUPPORTING INFORMATION FOR TIME-LIMITED AGING ANALYSES (TLAA)
TO BE INCLUDED IN LICENSE RENEWAL APPLICATIONS**

April 22, 2003

<u>Name (print)</u>	<u>Organization</u>
Jan E. Fridrichsen	Southern Nuclear
Alan Nelson	NEI
Garry G. Young	Entergy Nuclear
Gary M. Adkins	TVA
James E. Knorr	NMC, LLC
John Rycyna	Constellation
Deann Raleigh	LIS, Scientech
Gregory Twachtman	McGraw-Hill
Stephanie Coffin	NRR/DE/EMCB
Eric Blocher	Parsons Power
Ken Chang	NRR/DRIP/RLEP
Steve Hoffman	NRR/DRIP/RLEP
Tilda Liu	NRR/DRIP/RLEP
Wm "Butch" Burton	NRR/DRIP/RLEP
Peter J. Kang	NRR/DRIP/RLEP
Cliff Munson	NRR/DE/EMEB
John Fair	NRR/DE/EMEB
Duc Nguyen	NRR/DE/EEIB
Amar Pal	NRR/DE/EEIB
T.J. Kim	NRR/DRIP/RLEP
Hans Ashar	NRR/DE/EMEB
Mike Guthrie	Progress Energy LR
Barry Elliot	NRR/DE/EMCB
Carey W. Fleming	Winston & Strawn
Mark Hartzman	NRR/DE/EMEB
Sam Lee	NRR/DRIP/RLEP
James Medoff	NRR/DE/EMCB
Kris Parczewski	NRR/DE/EMCB
P.T. Kuo	NRR/DRIP/RLEP

Enclosure 2

**Information to be included in Section 4.2, TLAA,
of
the License Renewal Application**

Section 4.2, Reactor Vessel Neutron Embrittlement - The applicant should provide the following information for the staff to confirm all Upper Shelf Energy (USE) and Adjusted Reference Temperature (ART) calculations for the period of extended operation.

All Applicants

The applicant should identify the neutron fluence at the inside surface and the 1/4T location for each beltline material at the expiration of the license renewal period. The applicant should identify the methodology used in determining the neutron fluence and identify whether the methodology followed the guidance in Regulatory Guide (RG) 1.190.

The applicant should provide the following information for the staff to confirm the applicant's USE analysis meets the requirements of Appendix G of 10 CFR Part 50 at the end of the license renewal period:

- a) For each beltline material that is projected to exceed 50 ft-lb at the end of the license renewal period, the applicant should provide the unirradiated Charpy USE; the projected Charpy USE at the end of the license renewal period; whether the drop in Charpy USE was determined using the limit lines in Figure 2 of RG 1.99, Revision 2; or from surveillance data and the percentage copper.
- b) If an equivalent margins analysis was required to demonstrate compliance with the USE requirements in Appendix G of 10 CFR Part 50, the applicant should provide the analysis or identify an approved topical report that contains the analysis. Information the applicant should provide for the staff to assess the equivalent margins analysis includes: the unirradiated USE (if available) for the limiting material; its copper content, the fluence (1/4T and at 1 inch depth); the EOLE USE (if available); the operating temperature in the downcomer at full power; the vessel radius; the vessel wall thickness; the J-applied analysis for Service Level C and D; the vessel accumulation pressure; and the vessel bounding heatup/cooldown rate during normal operation.

Pressurized Water Reactors

The applicant should provide the following information for the staff to confirm the applicant's Pressurized Thermal Shock analysis results in RT_{PTS} values below the screening criteria in 10 CFR 50.61 at the end of the license renewal period:

- a) For each beltline material the applicant should provide the unirradiated RT_{NDT} ; the method of calculating the unirradiated RT_{NDT} (either generic or plant-specific); the margin; the chemistry factor; the method of calculating the chemistry factor; the mean value for the shift in transition temperature; and the RT_{PTS} value.
- b) If there are two or more data for a surveillance material that is from the same heat of material as the beltline material, the applicant should provide analyses to determine whether the data are credible in accordance with RG 1.99, Revision 2 and whether the margin value used in the analysis is appropriate.
- c) If there are two or more data for a surveillance material that is not from the same heat of material as the beltline material, the applicant should provide analyses of the data to determine whether the data is consistent with the RG 1.99, Revision 2 methodology.

Boiling Water Reactors

The applicant should evaluate beltline material in accordance with Renewal Applicant Action Items 10, 11, and 12 in the staff's SER, for BWRVIP-74 (Letter to C. Terry dated October 18, 2001).

The applicant should identify whether there are two or more surveillance material available that is relevant to the RPV beltline materials. If there are two or more data for a surveillance material, the applicant should provide analyses of the data to determine whether the data is consistent with the RG 1.99, Revision 2 methodology that was utilized in the BWRVIP-74 analyses.

Additional TLAA's for BWRs: The applicant should evaluate all TLAA's identified in NRC Staff License Renewal SERs for BWRVIP programs

**Summary of Staff's Comments
on April 22, 2003, TLAA
Meeting with NEI**

Identification of TLAA's (Section 4.1):

The applicant should address each item in SRP Tables 4.1-2 and 4.1-3. If an item is not applicable to the applicant's facility, then the applicant should state that it is not applicable. An example is inservice flaw growth analysis in Table 4.1-2 which is resulting in additional RAIs.

Reactor Vessel Neutron Embrittlement Analysis (RVNEA) (Section 4.2):

For RVNEA, the information submitted by the applicants should be of sufficient detail to permit the staff to confirm their calculated values for Upper Shelf Energy (USE) and Adjusted Reference Temperature (ART) at the end of the period of extended operation. The staff provided a list of information that should be included in Section 4.2 of SRP-LR.

Metal Fatigue Analysis (Section 4.3):

The staff considers pipe break postulation based on fatigue usage factor a TLAA. If an applicant postulated pipe breaks based on fatigue usage, then the applicant should identify pipe break postulation as a TLAA and address the issue.

Most applicants use a fatigue monitoring program to track the number of operational transient cycles at their facility. The applicants should compare the transients monitored with the transients described in the FSAR and discuss the reason for FSAR transients, if any, that are not monitored. The applicant should also provide the current cycle count and the number of cycles projected for 60 years of plant operation for each transient and discuss how these cycle counts were determined.

Applicants of Westinghouse facilities should address the applicant action items identified in the Westinghouse topical reports regardless of whether they intend to incorporate the report. The staff needs sufficient information to address the specific technical issues identified by these topical reports.

For ASME Class 2 and 3 or USAS 31.1 piping systems where the number of cycles is projected to exceed 7000, the applicants should provide the estimated cycles for the period of extended operation and a positive statement that the evaluation for the projected number of cycles demonstrates that the calculated stresses meet the allowable stresses in the specific design code for the projected number of cycles.

The staff reviews the applicant's environmental fatigue evaluations against the results presented in NUREG/CR-6260. The applicant should provide the design usage factors for these locations. Significant differences between the applicant's reported usage factor and the value presented in NUREG/CR-6260 may result in a staff RAI. If the applicant does not perform the environmental fatigue calculation, then the staff will perform a conservative estimate of the usage factor and discuss this in the safety evaluation report (SER). It would be advantageous for the applicant to perform this estimate instead of the staff.

The FSAR supplement should provide a summary description of the environmental fatigue evaluation and should include licensee commitments for further actions prior to the period of extended operation (i.e., licensee commitments regarding the surge line).

Environmental Qualification (EQ) of Electrical Equipment (Section 4.4):

An applicant must demonstrate TLAA of EQ of Electrical Equipment using one of the following:

- a. Existing calculation that demonstrates the equipment qualified life for 60 years.
- b. Perform calculation to demonstrate the equipment qualified life for 60 years. Components life-limiting condition may be due to thermal, radiation, and wear cycling for solenoids, motors, multi-pin connectors, MOVs, and limit switches, etc. The staff has been performing table top inspections on selected equipment for (i) and (ii) calculations.
- c. Will manage by aging management programs (amps). Re-analysis requires reviewing four attributes (i.e., analytical methods, data collection and reduction methods, underlying assumptions, and acceptance criteria and corrective actions). The staff finds that adequate information is provided in SRP-LR.

Concrete Containment Tendon (Section 4.5):

Current write-up in SRP-LR Section 4.5 is adequate for the applicants to provide description of their operating experiences. Whether an applicant chooses Option (i), (ii), or (iii) of 54.21(c)(1), the applicant has to provide the curves showing the trending of prestressing forces based on the operating experience. In the LRA, the staff does not require the applicant to provide details of technique used to develop the trending curves, if the applicant has used the guidelines given in RG 1.35.1 and NRC IN 99-10 in developing the representative curves. However, the applicants have not provided such information in the past LRAs. Therefore, RAIs were developed for this information.

Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis (Section 4.6):

Most applications provide very general and limited fatigue design information, in particular as pertains to bellows. The applicants' philosophy appears to be to provide as little information as possible. This invariably requires RAIs until the relevant information is submitted. Information that is often lacking are the design codes for the penetration components.

Information on penetrations is often confusing or contradictory. In one LRA, it was stated that cracking was the failure mode of bellows. It was also stated that some bellows were found to leak under containment leak testing. The applicant stated that these bellows leaked because of

deficient installation and not because of cracking. Although this contradiction was eventually resolved, it did not provide full assurance of the quality of the LRA .

Proprietary information and calculations in TLAA should be submitted. For example, in a unique TLAA, pertaining to a topic outside the normal review areas, the staff requested in an RAI that the applicant provide proprietary original design calculations to understand and verify the design approach. Such calculations are ordinarily submitted on the docket and treated as proprietary. In response, the applicant suggested that the staff examine the calculations at the plant site. After an additional verbal request, the applicant indicated that the staff could examine the calculations in their Rockville office. Finally, the applicant submitted this information on the docket. Applicants should be aware that proprietary design calculations are handled and treated like any other proprietary information, and should be submitted on the docket when needed by the staff to reach conclusions regarding plant safety.

Other Plant-Specific Time-Limited Aging Analyses (Section 4.7):

The staff cited three plant-specific TLAAs that may need to be addressed at facility.

1. Reactor coolant pump fly wheel fatigue growth model may need to be performed (depending on the facility and application) to ensure that pressure boundary is maintained against fly wheel missile.
2. CE half-nozzle designs and mechanical nozzle seal assemblies (MNSAs) - fatigue crack and ferritic boric acid corrosion assessments are necessary if relief has been granted to use either of these alternatives for repairing or replacing leaking Class 1 Alloy 600/690 nozzles.
3. Leak before break (LBB) - previous NRC-approved analysis needs to be reviewed to determine whether the assumptions and results of the LBB analysis are still bounding for the extended period of operation.

NUCLEAR ENERGY INSTITUTE

Project No. 690

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